

## SEQUENCE LISTING

&lt;110&gt; SAPPORO BREWERIES LTD.

&lt;120&gt; Barley Lipoxygenase-1 Gene, Selection Method for Barley, Materials for Malt alcoholic beverages and Method for Production of Malt alcoholic beverages

&lt;130&gt; FP04-0052

&lt;150&gt; JP 2003-083924

&lt;151&gt; 2003-03-25

&lt;160&gt; 11

&lt;170&gt; PatentIn version 3.1

&lt;210&gt; 1

&lt;211&gt; 240

&lt;212&gt; DNA

&lt;213&gt; Hordeum vulgare

|  |            |     |
|--|------------|-----|
| <400> 1  |            |     |
| ctcgccaagg cctacgtcgc cgtcaatgac tccgggtggc accagctcg  | cagccactgg | 60  |
| tacgttctcc acggtcgatg tgattcagtc agtcgatgca caacaactga | tcgaaatatg | 120 |
| attgattgaa acgcgcaggc tgaacactca cgccgtatg gagccgttcg  | tgatctcgac | 180 |
| gaaccggcac cttagcgtga cgcacccggt gcacaagctg ctgagccgc  | actaccgcga | 240 |

&lt;210&gt; 2

&lt;211&gt; 240

&lt;212&gt; DNA

&lt;213&gt; Hordeum vulgare

|  |            |     |
|--|------------|-----|
| <400> 2  |            |     |
| ctcgccaagg cctacgtcgc cgtcaatgac tccgggtggc accagctcg  | cagccactga | 60  |
| tacgttctcc acggtcgatg tgattcagtc agtcgatgca caacaactga | tcgaaatatg | 120 |
| attgattgaa acgcgcaggc tgaacactca cgccgtatg gagccgttcg  | tgatctcgac | 180 |
| gaaccggcac cttagcgtga cgcacccggt gcacaagctg ctgagccgc  | actaccgcga | 240 |

&lt;210&gt; 3

&lt;211&gt; 24

&lt;212&gt; DNA

&lt;213&gt; Artificial

&lt;220&gt;

&lt;223&gt; primer

&lt;400&gt; 3

ggagaggagg ccaagaacaa gatg 24

&lt;210&gt; 4

&lt;211&gt; 19

&lt;212&gt; DNA

&lt;213&gt; Artificial

&lt;220&gt;

&lt;223&gt; primer

&lt;400&gt; 4

ggttgccat ggcttagat 19

&lt;210&gt; 5

&lt;211&gt; 21

&lt;212&gt; DNA

&lt;213&gt; Artificial

&lt;220&gt;

&lt;223&gt; primer

|   |  |
|---|--|
| <400> 5<br>cacgtcgccg tccgatccat c  | 21   |
| <210> 6<br><211> 20<br><212> DNA<br><213> Artificial  |  |
| <220><br><223> primer   |  |
| <400> 6<br>ccatcacgca gggcatcctg  | 20   |
| <210> 7<br><211> 20<br><212> DNA<br><213> Artificial  |  |
| <220><br><223> primer   |  |
| <400> 7<br>gcgttggatga gcgtctgccc   | 20   |
| <210> 8<br><211> 24<br><212> DNA<br><213> Artificial  |  |
| <220><br><223> primer for LOX-1 with BamHI site   |  |
| <400> 8<br>ggatccatgc tgctgggagg gctg   | 24   |
| <210> 9<br><211> 25<br><212> DNA<br><213> Artificial  |  |
| <220><br><223> primer for LOX-1 with HindIII site   |  |
| <400> 9<br>aagcttttag atggagatgc tgttg  | 25   |
| <210> 10<br><211> 2668<br><212> DNA<br><213> Hordeum vulgare  |  |
| <400> 10<br>atgcgtgtgg gagggctgat cgacaccctc acggggccga acaagagcgc ccggctcaag<br>ggcacgggtgg tgctcatgcg caagaacgtg ctggacactca acgacttcgg cgccaccatc<br>atcgacggca tcggcgagtt cctcggcaag gggtcacct gccagcttat cagctccacc<br>gccgtcgacc aagacaacgg cggtcgcggg aagggtggcg cggaggccga gctggagcag<br>tgggtgacga gcctgcccgc gctgacgacg ggggagtcca agttccgcac caccttcgac<br>tgggagggtgg agaagctcgg ggtgccggc gccatctcg tcaacaacta ccacagctcc<br>gagttcctgc ttaaaaccat caccctccac gacgtccccg gccgcagccg caacctcacc<br>ttcgctgcca actcatggat ctaccccgcc gccaactacc gatacagccg cgtcttcttc<br>gccaacgaca cgtacccgtcc gagccagatg cggcggccg tgaagccgta ccgcgacgac | 60<br>120<br>180<br>240<br>300<br>360<br>420<br>480<br>540 |

|             |             |             |             |             |             |      |
|-------------|-------------|-------------|-------------|-------------|-------------|------|
| gagctccgga  | acctgcgtgg  | cgacgaccag  | cagggcccgt  | accaggagca  | cgaccgcato  | 600  |
| taccgtctacg | acgtctacaa  | cgacctcggc  | gagggccgccc | ccatccctcg  | cgcaactcc   | 660  |
| gaccaccctt  | accccgcccg  | cgccgcacg   | gagcgcaagg  | ccaacgccag  | cgaccggagc  | 720  |
| ctggagagcc  | ggctgtcgct  | gtctggagcag | atctacgtgc  | cgcgggacga  | gaagtccggc  | 780  |
| cacctaaga   | cgtccgactt  | cctggctac   | tccatcaagg  | ccatcacgca  | gggcattctg  | 840  |
| ccggccgtgc  | gcacctacgt  | ggacaccacc  | cccgccgagt  | tcgactcttt  | ccagcacatc  | 900  |
| atcaacctct  | atgaggcgg   | catcaagctg  | ccccagggtgg | ccgccttgg   | ggagctccgt  | 960  |
| aagcagtcc   | cgctccagct  | catcaaggac  | ctccctcccg  | tcggcggcga  | ctccctgott  | 1020 |
| aagctccccg  | tgccccacat  | catccaggag  | aacaaggcagg | cgtggaggac  | cgacgaggag  | 1080 |
| ttcgcacggg  | aggtgtcg    | cggcgtcaac  | ccggcatg    | tcacgcgtct  | cacggaggtc  | 1140 |
| ccggccaaaaa | gtagtcgttga | ccctagcaag  | tttggtacc   | acaccagcac  | catcacggcg  | 1200 |
| gagcacatag  | agaagaacct  | cgagggccctc | acgggtgcagc | aggcgcttgg  | aagcaacagg  | 1260 |
| ctgtacatcc  | ttgatcacca  | tgaccgggtt  | atggcgttcc  | tgatcgacgt  | caacaacctg  | 1320 |
| cccgccaaact | tcatctacgc  | cacgaggacc  | ctcttcttcc  | tgccgcggcga | cggcaggctc  | 1380 |
| acggccgtcg  | ccatcgagct  | gagcgagccc  | atcatccagg  | gcccgccttac | cacggccaag  | 1440 |
| agcaaggttt  | acacgcccgt  | gcccagcgcc  | tccgtcgaag  | gctgggtgt   | ggagctcgcc  | 1500 |
| aaggctctacg | tcgcccgtcaa | tgactccggg  | tggcaccagc  | tcgtcagcca  | ctgatacg    | 1560 |
| ctccacggtc  | gtatgtattc  | agtcaatcg   | tgccacaacaa | ctgatcgaaa  | tatgattgtat | 1620 |
| tgaaacgcgc  | aggctgaaca  | ctcacgcgg   | gatggagccg  | ttcgtatct   | cgacgaaccg  | 1680 |
| gcaccttagc  | gtgacgcacc  | cgggtcacaa  | gctgctgagc  | ccgcactacc  | gacgacaccat | 1740 |
| gaccatcaac  | gcgcgtggcgc | ggcagacgct  | catcaacgccc | ggcggcatct  | tcgagatgac  | 1800 |
| ggtgttcccg  | ggcaagttog  | cgttggggat  | gtcgccgt    | gtgtacaagg  | actgaaagt   | 1860 |
| caccgagcag  | ggactgcgg   | acgatctcat  | caagaggggc  | atggcggtgg  | aggacccgtc  | 1920 |
| gagccgtac   | aaggtgcgtt  | tgctgggtc   | ggactacccg  | tacgcggcgg  | acggctggc   | 1980 |
| gatctggcac  | gccattgago  | agtacgtgag  | cgagttacctg | gccatctact  | acccgaacga  | 2040 |
| cggcgtgtcg  | caggcgata   | cgagggtgca  | ggcgtgg     | aaggagacgc  | gacgaggtcg  | 2100 |
| gcacggcgcac | ctcaaggacg  | ccccatgg    | gcccaagatg  | caaagtgtgc  | cgagactggc  | 2160 |
| caaggcgtgc  | accaccatca  | tctggatcgg  | gtcgccgt    | catgcggcag  | tcaacttccg  | 2220 |
| gcagttaccc  | tacgcgggt   | tcctcccgaa  | ccggccgacg  | gtgagccggc  | gcgcgttcc   | 2280 |
| ggagcccgcc  | acggaggagt  | acgcggagct  | ggagcgcac   | ccggagccgg  | ccttcattcca | 2340 |
| caccatcagc  | agccagatcc  | agaccatcat  | cgccgtgtcg  | ctgttggagg  | tgctgtcgaa  | 2400 |
| gcactccccc  | gacgagctgt  | acctcggtca  | gcgggacacg  | ccggaggtgg  | cctccggaccc | 2460 |
| aaaggccctg  | gaggtgttca  | acgggttcag  | cgaccggctg  | gtggagatcg  | agagcaaggt  | 2520 |
| ggtggccatg  | aaccatgacc  | cgagactaa   | gaaccgcaac  | ggcccgctt   | agttccctaa  | 2580 |
| catgtgctc   | taccccaaca  | cctccgacca  | caagggcggc  | gctgcggg    | ttaccgccaa  | 2640 |
| gggcatcccc  | aacagcatct  | ccatctaa    |             |             |             | 2668 |

<210> 11  
 <211> 4393  
 <212> DNA  
 <213> Hordeum vulgare

|   |      |
|---|------|
| <400> 11  |      |
| cacgtcgcc tccgatccat ctctccaaag ccgagcgc ca caccacccgg accggaccg      | 60   |
| gaccggccta taaaattgccc ggacccgagct gcaaggcagct cctcacacac actcacgc aa | 120  |
| cacacatcca tcttcaactga aaagtaaaa acagtgtgt ggtgcattt gttggagcag       | 180  |
| tgaaagcgag gagaggaggc caagaacaag atgctgctgg gagggctgat cgacaccctc     | 240  |
| acggggcga acaagagcgc ccggctcaag ggcacggtg tgctcatgcg caagaacgtg       | 300  |
| ctggaccta acgacttcgg cgccaccatc atcgacggca tcggcgagt cctcgcaag        | 360  |
| ggcgtcacct gccagcttat cagctccacc gccgtcgacc aaggtaatca ctaccctct      | 420  |
| ccggccttct cctctgttta caagatata tag tatttcttc gtgtggccg gggccatgg     | 480  |
| atggatggat gtgtctggat cggctaaaga agataggata gctagccctg gccggctg       | 540  |
| tttacctgag catgggcata tgccatcgaa aaaagagaca acagcatgca tgcattgtgc     | 600  |
| gogcaccaga ccacgcagag cacccgtatc tcgagacaaa gcaacacaaac aagcaaggac    | 660  |
| gacacgtcaa aagcaacaca acaagcaagg acggcacgtc aaaagcaaca caaacctaaa     | 720  |
| ctaaagcaca aagacgtaa agcaaggcaca caatcagcag gctataaaca gttgtcatca     | 780  |
| aaaacaacgc tggaaagagag agagaaggaa ggaagtagta gccatgaaaa attaaatcac    | 840  |
| cggcggttgc tcttgcacc acaattaatc aagcagggtt cgtggcatgt atagtttttgc     | 900  |
| taagtaaact aagcatgtga tatgagaagg tacgtgggg tgcagacaaac ggcggctg       | 960  |
| ggaaggtgg cgccggaggcg gagctgggac agtgggtgac gagcctggcg tcgctgacga     | 1020 |
| cgggggagtc caagttcgcc ctacacccgt actgggaggt ggagaagctc ggggtgcgg      | 1080 |
| gcgcacatgt cgtaacaacaac taccacagct ccgagttctt gctaaaaacc atcacccctcc  | 1140 |
| acgacgtccc cggccgcagc ggcaacctca cttcgctgc caactcatgg atctaccccg      | 1200 |
| cgcaccaactt ccgatacagc cgcgtttct tcgccaacga cgtgcgtgg ttttctcta       | 1260 |
| ctttctctc ctttcatttt caccgccttc gtcattcatg gtcgatcatt aagtcttgc       | 1320 |
| aggacaatag atgatgagct aggagtggtt accacttagc agtacgtaca ttattttttc     | 1380 |
| cgtgttggta gaaaaggata tgggttggt cagatcgaca caagattgaa tgaaagtgc       | 1440 |
| accgtggcac cgtggcagcg tggtaggtga aaataactgt tgcacggatc caccacatg      | 1500 |
| attgtttca tgaataaact ttttaaggat gtgtcttagcc acatcttagat gcatgtcaca    | 1560 |
| taattattgc ataccaaaac gattaaatta agcataaaaaa gaaaaggaaa aaaatactca    | 1620 |
| catatctcga cgtaagatca atgatatagt atttagatat gcaatattta tcttacatct     | 1680 |
| aaaccccttc tcattcctaa atataagaca ttgttaagat ttcaactatgg acaacatacg    | 1740 |
| aaacaaaatc agtggatctc tctatgcatt cattatgtatg tctataataa aatctttaaa    | 1800 |
| agatcgtata ttttgcacg gagggagtaa aacataactt tttaatagta atgtgcacg       | 1860 |
| gctccacact cgcagacgt cctggcgcagc cagatgccgg cggcgctgaa gccgtaccgc     | 1920 |
| gacgacgagc tccggAACCT gcgtggcgcac gaccagcagg gcccgtacca ggagcacgac    | 1980 |
| cgcacatctacc gctacgcacgt ctacaacgcac ctggcgagg gcccggccat cctggcggc   | 2040 |
| aactccgacc acccttaccc ggcggcggc cgcacggagc gcaagcccaa cgcacgcac       | 2100 |
| ccgagcctgg agagccggct gtcgtgtgt gaggcagatct acgtgcgcgg ggacgagaag     | 2160 |
| ttcggccacc tcaagacgtc cgttccatg ggctactcca tcaaggccat cacgcaggc       | 2220 |
| atccctggccgg cgcgtgcgcac ctacgtggac accacccccc ggcgatgtcga ctccctccag | 2280 |

|  |      |
|--|------|
| gacatcatca acctctatga gggcgccatc aagctgccca aggtggccgc cctggaggag        | 2340 |
| ctccgttaagc agttcccgct ccagctcatc aaggacotcc tccccgtcgg cggcgactcc       | 2400 |
| ctgtttaagc tccccgtgcc ccacatcatc caggagaaca agcaggcgtg gaggaccgac        | 2460 |
| gaggagttcg cacgggaggt gtcgcggc gtcaacccgg tcatgatcac ggtctcacg           | 2520 |
| gtgagtccgc gattatttgt tcattgtgt tgtaggtgt ccatggtag aaagtgcaga           | 2580 |
| tcttgatttg cggtgggtcg catgcacgca tgctgcatgc atgcaggagt tcccgc当地          | 2640 |
| aagtagtctg gacccttagca agtttggta ccacaccagg accatcacgg cggagcacat        | 2700 |
| agagaagaac ctgcagggcc tcacgggtcga gcaggtaattt ggtccaagcc atcgacatca      | 2760 |
| actatgattt accttaggat aatggtagc tgtagataat ttggcttcgt tgc当地              | 2820 |
| ttgatgtgg ccgatcaagt gatcgatattt gggttggaaat ttgcaggcgc tggaaagcaa       | 2880 |
| caggctgtac atccctgatc accatgaccg gttcatgcgc ttccctgatcg acgtcaacaa       | 2940 |
| cctgcccggc aacttcatct acgccacgag gacccttcc ttccctgcgcg ggcacggcag        | 3000 |
| gctcaegccg ctgcgc当地 cg agtgcgc当地 gccc当地 caggcgc当地 ttaccacggc             | 3060 |
| caagagaag gtttacacgc cgggtggccag cggctccgtc gaaggctggg tgtggagct         | 3120 |
| cggccaggcc tacgtcgccg tcaatgactc cgggtggcac cagctcgta gccactgata         | 3180 |
| cgttctccac ggtcgatgtg attcagtc当地 tcgatgc当地 acaactgatc gaaatatgat         | 3240 |
| tgattgaaac ggcaggcgtg aacactcactc cgggtatggg gccc当地 tgc当地 atctcgacga     | 3300 |
| accggcacct tagcgatcgcc caccgggtgc acaagctgtc gagccgc当地 taccgc当地          | 3360 |
| ccatgaccat caacgc当地 ggc当地 caga cgctcatcaa cggccggc当地 atcttc当地            | 3420 |
| tgacgggtt cccggcaag ttgc当地 tggg ggtatgc当地 cgtggtagt aaggactgga           | 3480 |
| agttcaccga gcaggactg coggacgatc tcatcaagag gtacgtacct ggtaaatgtt         | 3540 |
| atgaatgtgt aaaacaattt gggctctcg ctcaactgaca ggaacgtgtt aaaaaaaaaatg      | 3600 |
| cagggc当地 ggc当地 ggagg acccgatcgcc cccgtacaag gtgc当地 ttgc当地 tgggatcgga     | 3660 |
| ctaccctgatc gccc当地 gacg ggctggcgat ctggc当地 caccgc当地 attgagc当地 acgtgc当地   | 3720 |
| gtacctggcc atctactacc cgaacgc当地 cgtgc当地 cag ggatgc当地 cggc当地              | 3780 |
| gtggatggaaag gagacgc当地 aggtc当地 gggca cggc当地 acctc aaggacgc当地 catggatggcc | 3840 |
| caagatgcaagtgtgccgg agctggccaa ggc当地 tc当地 accatcatct ggatcgatggc         | 3900 |
| ggcgctgatc gccc当地 cacttgc当地 gtaccctac gccc当地 ttccgc当地 acccg              | 3960 |
| ggccgacggc当地 agccggcc当地 gcatggc当地 gccc当地 acgg gaggatc当地 cggatcgatggc     | 4020 |
| gccc当地 gagatccacac catcactgac cagatccaga ccatcatcg                       | 4080 |
| cgtgc当地 ctggaggatgc tgc当地 gagatc当地 ctccctccgac gagatgc当地 tccggc当地 acggc  | 4140 |
| ggacacgc当地 gagatggaccc gggatggccaa ggc当地 tc当地 accatcatct ggatcgatggc     | 4200 |
| ccggctggatc gagatcgatggc gcaaggatggc gggatgc当地 catgacccgg agctcaagaa     | 4260 |
| ccgc当地 acggc当地 cccgatcaatc tccctccatc gtc当地 ctac cccaaacccat cccgaccacaa | 4320 |
| gggc当地 cccgatc gccc当地 ttca cccgatgc当地 catccccaaac agcatctcca tctaattaa   | 4380 |
| ccatcgatc acc  | 4393 |